Unpacked South Dakota State Mathematics Standards

Purpose: *In order for students to have the best chance of success, standards, assessment, curriculum resources, and instruction must be aligned in focus, coherence, and rigor. Unpacked standards documents are intended to help align instruction to the focus, coherence, and rigor of the South Dakota State Mathematics Standards. The standards have been organized in clusters as they are not so much built from topics, but rather woven out of progressions. Not all content in a given grade is emphasized equally in the mathematics standards. Some clusters require greater emphasis than others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting standards will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade.*

Domain: Expressions and Equations	**Grade Level: 7th**

7.EE.B Cluster: Use properties of operations to generate equivalent expressions.

Students apply properties of operations to add, subtract, factor and expand linear equations with rational coefficients. Students then become able to rewrite expressions in different forms to solve a multi-step problem, explain the quantities and graph a solution.

****This is a MAJOR cluster.** *Students should spend the large majority of their time (65-85%) on the major work of the grade. Supporting work and, where appropriate, additional work should be connected to and engage students in the major work of the grade.*

7.EE.3. Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically.

- **a.** Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate. For example, if a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50.
- **b.** Assess the reasonableness of answers using mental computation and estimation strategies. For example, if you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation

7.EE.4. Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

- **a.** Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.
- **b.** Solve word problems leading to inequalities of the form $px + q > r$, $px + q \geq r$, $px + q < r$, and $px + q \leq r$ where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. For example, as a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make, and describe the solutions.

Aspects of Rigor for Student Learning:(Conceptual, Procedural, and/or Application)

Conceptual Understanding	***Procedural Fluency***	***Application***
Interpret percents as both fractions and decimals. **(7.EE.3)** Determine the reasonableness of answers using mental computation and estimation. **(7.EE.3)**	Compute (add, subtract, multiply and divide) rational numbers in various forms. **(7.EE.3a)** Choose between forms of a rational number to simplify calculations or communicate solutions meaningfully. **(7.EE.3)**	Extend computations of rational numbers to real-world situations (e.g. discounts, commissions, perimeter, area, etc.). **(7.EE.3)** Apply an appropriate estimation strategy to the solution and justify that the answer is reasonable. **(7.EE.3b)**

Understand and utilize a variable's representation for an unknown quantity in an equation and/or inequality using models/ manipulatives. **(7.EE.4)** Recognize that variables can be used to represent unknown quantities in equations and inequalities, as well as in situations requiring a model or a manipulative. **(7.EE.4)** Connect arithmetic solution processes that do not use variables to algebraic solution processes that use equations. **(7.EE.4)** **Note:** In 6th grade, students encounter solving equations from an inspection standpoint. For example, to solve x + 4 = 7, students are only expected to know that x is 3 because 3 + 4 =7. They now will be asked to demonstrate the procedure of subtracting 4 from both sides of the original equation to yield a solution of x = 3. Distinguish between equations and inequalities. **(7.EE.4)**	Solve multi-step equations or inequalities, including those with negative coefficients. Identify the sequence of operations used. **(7.EE.4)** **Note:** Multiplying or dividing both sides of an inequality by a negative number reverses the order of the comparison it represents. Graph the solution set on a number line. **(7.EE.4b)** **Note:** Inequalities using $\geq$ and $\leq$ are included in this standard.	Write an equation or inequality from the context of a mathematical problem. **(7.EE.4)** Interpret the solution of an equation or inequality in terms of the context of the problem.**(7.EE.4)** Interpret the meaning of a solution from a given graph. **(7.EE.4b)**

Enacting the Mathematical Practices - Evidence of Students Engaging in the Practices

- **Make sense of problems and persevere in solving them.**
  - Students create equations and inequalities based on real-world descriptions.
  - Students solve a variety of multi-step problems.
- **Reason abstractly and quantitatively.**
  - Students model equivalent expressions that are represented in a variety of forms (e.g. fractions, percents and decimals).
  - Students solve problems by reasoning about equations and inequalities.
- **Construct viable arguments and critique the reasoning of others.**
  - Students will use appropriate estimation strategies to justify that the solution is reasonable.
  - Students will explain the meaning of a given expression and its component parts in terms of a context.
- **Model with mathematics.**
  - Students model equations and expressions using manipulatives and algebraic symbols**.**
  - Students model the solutions to inequalities using number lines.
- **Use appropriate tools strategically.**
  - An optional tool would be to use online resources that allow students to solve equations using visual models.
- **Attend to precision.**
  - Students will have a number of opportunities to round appropriately.
  - Students justify their reasoning using precise mathematical vocabulary
  - Students determine the reasonableness of answers based on estimation strategies..
- **Look for and make use of structure.**
- **Look for and express regularity in repeated reasoning.**

Vertical and Horizontal Coherence and Learning Progressions		
Previous Learning Connections	***Current Learning Connections***	***Future Learning Connections***
In 6th grade, learners use variables to represent numbers and write expressions when solving a real-world or mathematical problem In 6th grade, learners understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true. In 6th grade, learners solve real-world and mathematical problems by writing and solving equations of the form x + p = q and px = q for cases in which p, q and x are all nonnegative rational numbers. In 6th grade, learners write an inequality of the form x > c or x < c to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form x > c or x < c have infinitely many solutions; represent solutions of such inequalities on number line diagrams.	In 7th grade, learners will develop an understanding of operations with rational numbers when working with expressions and linear equations. In 7th grade, learners will apply knowledge of working with expressions and equations to solve problems involving scale drawings and informal geometric constructions, and work with two- and three-dimensional shapes to solve problems involving area, surface area, and volume. In 7th grade, learners will use vertical angles, adjacent angles, angles on a line, and angles at a point in a multi-step problem to write and solve equations for an unknown angle in a figure.	In 8th grade, learners perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology. In 8th grade, learners solve linear equations (including rational number coefficients) in one variable with one solution, infinitely many solutions, or no solutions. In 8th grade, learners analyze and solve pairs of simultaneous linear equations (in one and two variables) and understand that solutions correspond to points of intersection of their graphs.
Vocabulary *(Key Terms Used by Teachers and Students in this Cluster):*		
● Terms ● Coefficient ● Like-terms ● Distribute ● Expression ● Equivalent ● Simplify ● Expand ● Factor	● Linear expression ● Inequality (at most, at least) ● Greater than (>) ● Less than (<) ● Greater than or equal to (≥) ● Less than or equal to (≤) ● Solution set ● Equivalent expressions ● Variable	● Estimate ● Reasonableness ● Algebraic solution ● Arithmetic solution ● Equation ● Inverse operations ● Distributive property ● Commutative property ● Associative property
Relevance, Explanations, and Examples:		
Example for 7.EE.4a		

The youth group is going on a trip to the state fair. The trip costs $52. Included in that price is $11 for a concert ticket and the cost of 2 passes, one for the rides and one for the game booths. Each of the passes cost the same price. Write an equation representing the cost of the trip and determine the price of one pass.

Solution:
x = cost of one pass

x	x	11
52		

$2x + 11 = 52$
$2x = 41$
$x = \$20.50$

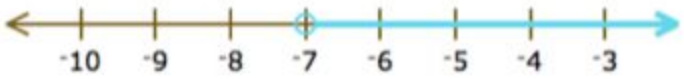
Example 7.EE.4b

Florencia has at most $60 to spend on clothes. She wants to buy a pair of jeans for $22 dollars and spend the rest on t-shirts. Each t-shirt costs $8. Write an inequality for the number of t-shirts she can purchase.

Solution:
x = cost of one t-shirt
$8x + 22 \leq 60$
$x = 4.75 \rightarrow$ 4 is the most t-shirts she can purchase

Solve $-0.5x - 5 < -1.5$ and graph the solution on a number line.

Solution:
$x > -7$



Example 7.EE.3b

Estimation strategies for calculations with fractions and decimals extend from students' work with whole number operations. Estimation strategies include, but are not limited to:

- front-end estimation with adjusting (using the highest place value and estimating from the front end making adjustments to the estimate by taking into account the remaining amounts),
- clustering around an average (when the values are close together an average value is selected and multiplied by the number of values to determine an estimate),
- rounding and adjusting (students round down or round up and then adjust their estimate depending on how much the rounding affected the original values),
- using friendly or compatible numbers such as factors (students seek to fit numbers together – i.e., rounding to factors and grouping numbers together that have round sums like 100 or 1000), and
- using benchmark numbers that are easy to compute (students select close whole numbers for fractions or decimals to determine an estimate).

Achievement Level Descriptors	
***Cluster:* Use properties of operations to generate equivalent expressions.**	
Concepts and Procedures	**Level 1:** Level 1 students should be able to solve multi-step problems with integers or common fractions with denominators of 2 through 10, 25, 50, or 100 and decimals to the hundredths place; solve equations in the form of px + q = r, where p, q, and r are integers; and distinguish between inequalities and equations with integer coefficients with or without real-world context.

	Level 2: Level 2 students should be able to solve multi-step problems with rational numbers and solve equations in the form of $px + q = r$ or $p(x + q) = r$, where p, q, and r are rational numbers. Students should be able to use variables to represent quantities in familiar real-world and mathematical situations. They should also be able to create equations with variables to solve familiar problems with a high degree of scaffolding.
	Level 3: Level 3 students should be able to solve and graph solution sets to inequalities with one variable. They should be able to use variables to represent and reason with quantities in real-world and mathematical situations with minimal scaffolding. They should also be able to construct equations with variables to solve problems.
	Level 4: Level 4 students should be able to use variables to represent and reason with quantities in real-world and mathematical situations with no scaffolding. They should be able to construct inequalities with more than one variable to solve problems.